LAWRENCE
LIVERMORE
NATIONAL
LABORATORY

LLNL-TR-478551

Seaborne Delivery Interdiction of Weapons of Mass Destruction (WMD)

H. Glauser

April 4, 2011

Disclaimer

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Seaborne Interdiction of WMD
by Hank Glauser

Over the next 10-20 years, the probability of a terrorist attack using a weapon of mass destruction (WMD) on the United States is projected to increase[1]. At some point over the next few decades, it may be inevitable that a terrorist group will have access to a WMD. The economic and social impact of an attack using a WMD anywhere in the world would be catastrophic.

For weapons developed overseas, the routes of entry are air and sea with the maritime vector as the most porous. Providing a system to track, perform a risk assessment and inspect all inbound marine traffic before it reaches US coastal cities thereby mitigating the threat has long been a goal for our government. The challenge is to do so effectively without crippling the US economy.

The Portunus Project addresses only the maritime threat and builds on a robust maritime domain awareness capability[2]. It is a process to develop the technologies, policies and practices that will enable the US to establish a waypoint for the inspection of international marine traffic, screen 100% of containerized and bulk cargo prior to entry into the US if deemed necessary, provide a palatable economic model for transshipping, grow the US economy, and improve US environmental quality. The implementation strategy is based on security risk, and the political and economic constraints of implementation. This article is meant to provide a basic understanding of how and why this may be accomplished.

The Treat of Terrorism

Terrorist activity has demonstrated the ability to disrupt the US economy and squander precious economic resources by elevating national security spending. The necessary strategy of providing a broad defense against an adversary that can attack anywhere in moderate scale is problematic and costly.

We must avoid the mistakes the Soviets made in the Cold War, when the Soviet Union essentially bankrupted itself and ultimately collapsed. They believed they were under threat and to secure their safety, they got into an arms race they could not afford.

The danger exists for the US to do the same with regards to the protection of US interests from terrorism. The economic models favor the terrorist who can place a bomb on target to deliver moderate damage at relatively low cost. Defense against, and response to such a threat has, and will continue to consume vast amounts of financial resources. The result of which will be a burden to our economic engine in order for us to achieve a reasonable and socially acceptable level of risk.

---

[1] National Intelligence Council, *Mapping the Global Future*, Dec. 2004
[2] National Plan to Achieve Maritime Domain Awareness, Oct. 2005

This strategy is sub-optimal and unsustainable. The spending to secure our borders and citizenry could be just as damaging in the long-term as an attack. If we want to survive the next century, we will need to be a bit more thoughtful and creative. Fortunately, these traits are part of the American character.

I don't believe there is debate that we are a target for terrorism. But how credible is it that a terrorist could obtain a nuclear weapon? "A terrorist group might obtain [material for] a bomb, perhaps with the yield of the Hiroshima bomb, by several plausible routes…"[3] Controls for highly enriched uranium (HEU) in Russia, Pakistan and India are not certain. Emerging nuclear states like North Korea and Iran have demonstrated support for terrorist activities, with North Korea exporting technologies associated with production of HEU and Iran reportedly developing an inventory.

Despite our best efforts, the technologies and materials for the development of nuclear weapons are proliferating. The sophistication needed to build a nuclear device is not that demanding once you have the raw materials. The Hiroshima bomb was so simple a design that scientists didn't even need to test it.

The impact of a radiological weapon detonated at a US port would affect the entire country. Other than the devastating direct damage such a weapon would cause, collateral impacts would include contamination, chronic illness, economic collapse, port shutdowns, border closures, suspended air traffic, fallout possibly effecting national agricultural production and exports, increased consumption of food and consumables like fuel, without the ability to replenish stores leaving shortages nationwide. We would also respond militarily and will need to re-open our ports and borders up quickly to sustain a war effort. Without a viable alternative, this action would result in opening ourselves up to the same vulnerability that was just exploited.

So where's that leave us? Our ports are vulnerable, critical to our economy, and located in large population centers on our borders. The critical question is, "How realistic is the assumption that we can prevent the proliferation of WMD to terrorists indefinitely?"

Efforts to date have provided protection, but there are still acknowledged gaps in our defense. When the threat is elevated due to the proliferation of nuclear weapons or other WMD, our current protection scenario no longer can accept the present level of risk because the social and economic costs of a WMD attack are so severe. It will take time to develop a workable solution. The goal is to have such as solution in place before the terrorists can act on their WMD threats.

A Vision for Protection

To protect from the treats mentioned above we need to integrate a few emerging trends and technologies. A robust Maritime Domain Awareness (MDA) integrates information from intelligence networks, maritime commerce databases, government sources and

[3] Medalia, J., CRS Report for Congress: *Terrorist Nuclear Attacks on Seaports: Threat and Response,* RS21293, January 24, 2005.

monitoring technologies to get an understanding of the vessels en route to the US. This system can track marine craft much like air traffic control systems, with the added component of providing a risk assessment for each vessel. Inbound craft will be monitored and directed to offshore platforms located in major sealanes for inspection.

The offshore platforms can be fitted out with technologies that can inspect bulk freighters and private craft quickly and efficiently. They can also provide a capability to significantly improve cargo handling times, making it more efficient for a shipping company to offload and onload all their cargo at the platform capitalizing on their investments in larger and larger containerships increasing the number of runs per year. US flagged Jones Act carriers can then move cargo directly to destination ports. Since the Jones Act carriers are generally smaller than the larger international freight haulers, ports will neither have to spend billions of dollars on infrastructure and civic improvements nor will they need to dredge, avoiding serious environmental concerns.

The platforms will also house state-of-the-art screening technologies capable of keeping up with the high throughput of freight. In this way the US can achieve 100% screening of all inbound containers, small ships and bulk freighters before these vessels, their cargo or their crews can threaten the US. This system potentially has the benefit of improving US supply chain logistics, invigorating domestic industries, and improving environmental quality all while improving homeland security.

The operational goal for this effort of unloading, inspection and reloading is to be able to unload and reload a 15,000 TEU ship in less than 24 hours. When containers have completed this process, they have completed US customs inspections and appropriate tariff assessments (which are more accurate based on the screening technology resulting in an expected initial increase in tariff collections of 10%). Receivers can be alerted automatically when cargo is loaded with expected delivery times at domestic ports of call or railheads so that pick-ups can be scheduled. They can also be informed of pending Custom's holds. Items to be held in a bonded warehouse will be held at existing land-based facilities.

This process will not result in additional delays but is designed to fit within existing delivery timetables. If the project is government funded, cost savings in other infrastructure investments, transition of federal spending and increased customs revenues offset much of the project costs. If the project is privately funded, then contracts with the government, and small up charges in handling fees will provide the returns on investment.

Although preliminary work shows an overall benefit to US society, the impetus for a shipper to bypass the offshore ports boils down to an economic argument. Can a shipper deliver US bound goods to a port in Mexico (such as the newly improved port at Manzanillo) and bring them into the US cheaper than utilizing the offshore port?

It can cost a few hundreds of dollars to move one container of freight about 1000 miles, about the distance from Manzanillo to major US rail hubs in California or Texas. In addition to this charge, there will be an additional customs point and resulting fees. Another challenge for the shipper will be the capacity of rail to move that cargo.

At Risk

The cost of a WMD attack on the US is estimated to be significant. By one estimate, a 10- to 20-kiliton weapon (a Hiroshima-sized nuclear bomb is about 15 kilotons) detonated in a major seaport would kill 50,000 to 1 million people and would result in direct property damage of $50 to $500 billion, losses due to trade disruption of $100 to $200 billion, and indirect costs in the hundreds of billions.[4] Even a near miss event could cost the government tens of billions of dollars. Response scenarios when a device or attack is discovered at a port would likely include shutdowns at other ports, inspections of containerized cargo on road and rail systems, and significant constraints on international imports as ports are cleared to open after expanded inspection protocols.

From the CBP Strategic Plan, experts have estimated that the cost to the U.S. economy resulting from port closures due to the discovery or detonation of a weapon of mass destruction or effect (WMD/E) would be enormous. In October 2002, Booz, Allen and Hamilton reported that a 12-day closure required to locate an undetonated terrorist weapon at one U.S. seaport would cost approximately $58 billion. In May 2002, the Brookings Institution estimated that costs associated with U.S. port closures resulting from a detonated WMD/E could be severe, assuming a prolonged economic slump due to an enduring change in our ability to trade.

Currently to protect the US from this threat we use a defense in depth policy. Our defense in depth strategy relies on denial of technology, foreign government intervention at the port of origin, intelligence gathering and paperwork reviews. The US spends billions of dollars each year on these efforts. However, while this policy support is appropriate for the current level of risk, it is far from ideal and insufficient as the threat level rises.

Our Defense in Depth Strategy

The US Container Security Initiative (CSI) places scanning technologies in foreign ports and assists in the operation of the scanners with the cooperation of port authorities/operators. Approximately 60 international ports operate under the CSI program scanning about 85% of inbound containers. Ideally the scanners flag suspect containers real time and response measures can be taken at the overseas port.

Other measures in place in our defense in depth strategy require shippers to turn in manifests electronically 24 hours prior to departure enroute to the US. Manifests are scanned for suspicious items. Security seals are also used on containers to identify tampering with cargo. These measures, and a few others, coupled with ongoing intelligence efforts provide the current comfort factor within the Department of Homeland Security that risks are mitigated to a reasonable level given the current threat

---

[4] ABT Associates, "*The Economic Impact of Nuclear Terrorist Attacks on Freight Transport Systems in an Age of Seaport Vulnerability," April 2003, p7.*

and funding constraints.

Given current threat levels, the CSI and related programs provide an adequate defense. Unfortunately, the threat level may not remain constant due to the proliferation of nuclear weapon technology and the increasing availability of materials. Therefore, our defensive posture should also increase over time as our risk increases.

For commercial maritime traffic, reliance on the Container Security Initiative is problematic. Fundamentally how certain are we in relying on everyone else for our survival? Additionally not all cargo bound for the US passes through the cooperative ports identified in the CSI, containers transferred between ships can bypass screening, manifests can be falsified, employees and port officials can be compromised. The strategy leaves us with a false sense of security.

There have been many concerns raised regarding the mandate to scan 100% of incoming containerized freight. Not the least of which is a concern over shipment delays and cost. I agree with these concerns in the context of handling freight with existing systems and technologies. However, providing a capability that improves handling rates significantly and improves the logistics of shipping while achieving the 100% goal is a different animal. An offshore port utilizing state of the art technologies has the potential of achieving this goal. Trying to achieve this goal at numerous foreign ports is unrealistic.

What if a terrorist were able to put a WMD on a ship after it left one of those ports? Or if a terrorist group put a WMD on any ocean-going vessel and just brought it into a US coastal city? What controls are in place for these scenarios?

Our current capability is that once a threat is identified, the ship is intercepted at sea and an onboard inspection of containers/crew/cargo is performed. If this inspection is not satisfactory, a more detailed inspection should occur. Here is where another problem arises. A limited capability exists to allow a few containers to be unloaded onto inspection ships at sea, provided the containers are accessible to the cranes onboard which is far from certain given the ever increasing size of commercial ships. Ships can be diverted to remote ports or returned to foreign ports of origin, but other governments would be understandably resistant to bring a ship with a suspect WMD onto their soil.

The Government Accountability Office (GAO) reported in December of 2009 that DHS has used technologies like mobile radiation scanners successfully at foreign ports, though the level of participation at test ports remains a problem. There are also troubling numbers. The GAO found that the 54-86% of U.S.-bound cargo containers that were scanned at three ports together account for less than 3% of container shipments to the U.S., and that CBP "has not been able to achieve sustained scanning rates above 5%" at two larger ports that handle much more U.S.-bound cargo.[5]

In addition to scanning, about 5% of cargo is inspected. Unlike the CSI, when inspections occur, they mostly occur on US soil, so a WMD device is already in a place where

[5] McLeary, P., *US Port Security is a Global Issue*, Aviation Week, April 15, 2010.

critical infrastructure and coastal populations are placed at risk. Also at risk is the shipping company, which relies on access to the US marketplace from multiple ports.[6]

Commercial traffic is not the only threat, or arguably even the most credible one. Any craft with transoceanic capability can carry a WMD to coastal population centers bypassing international inspections. This methodology is consistent with terrorist operations that maintain control of their weapons to the point of detonation. The DHS recently launched a pilot program to scan small craft in the San Diego and Puget Sound waterways using small boats with specialized equipment. However, this approach also has its challenges.

For private maritime traffic, transpacific and transatlantic yachts "check in" upon arrival at a US port. During fiscal year 2006, only 70,000 boater foreign arrivals were recorded in the U.S. Customs and Border Protection (CBP) Pleasure Boat Reporting System (PBRS), based on boater self-reporting. Conservative estimates suggest that these reporting figures represent only a fraction of the actual international boater traffic, especially given the ease with which boaters operate in these waters.[7] The conclusion is that given access to a WMD, a terrorist organization can credibly attack a target along any waterway or a port city directly. Even if detected by a program similar to DHS' West Coast Maritime Pilot effort mentioned above, the weapon is already in the waterways of the US and can be detonated to devastating effect.

An Alternative Strategy

The solution is not to expand the CSI, but to transition from the CSI to provide a scalable capability that inspects ships and cargo at sea by US controlled assets, based on a risk assessment integrated with maritime domain awareness systems. By providing a scalable response to threats, offshore inspection capabilities can be adopted and modified as conditions dictate. The economic impacts of this system are complicated and should be approached with great care and consideration.

An ability to inspect ships offshore is a reasonable capability for the US government to provide, hopefully prior to the proliferation of WMD to terrorists. This capability would negate the problems identified so far.

This audacious goal is strategic, looking out beyond the immediate threat. "As technology becomes less expensive and more widely available, our adversaries will focus on vulnerabilities, attacking our populations, centers of commerce and our integrated global economy, including our social networks and the facilitating but vulnerable global commons that we use to connect and prosper: the sea, air, space and cyberspace. Ensuring access and use of the global commons will be of central importance to security and prosperity of our peoples, and to successful Alliance operations."[8]

---

[6] Greenberg, M., et.al., *Maritime Terrorism Risk and Liability*, RAND Corporation
[7] Department of Homeland Security, *Small Vessel Security Strategy*, April 2008
[8] Admiral Zappata, Deputy Supreme Allied Commander Transformation, NATO, *Keynote Address New York 360 w/ NATO*, text provided by Lloyds Corp., 29 Oct 2009.

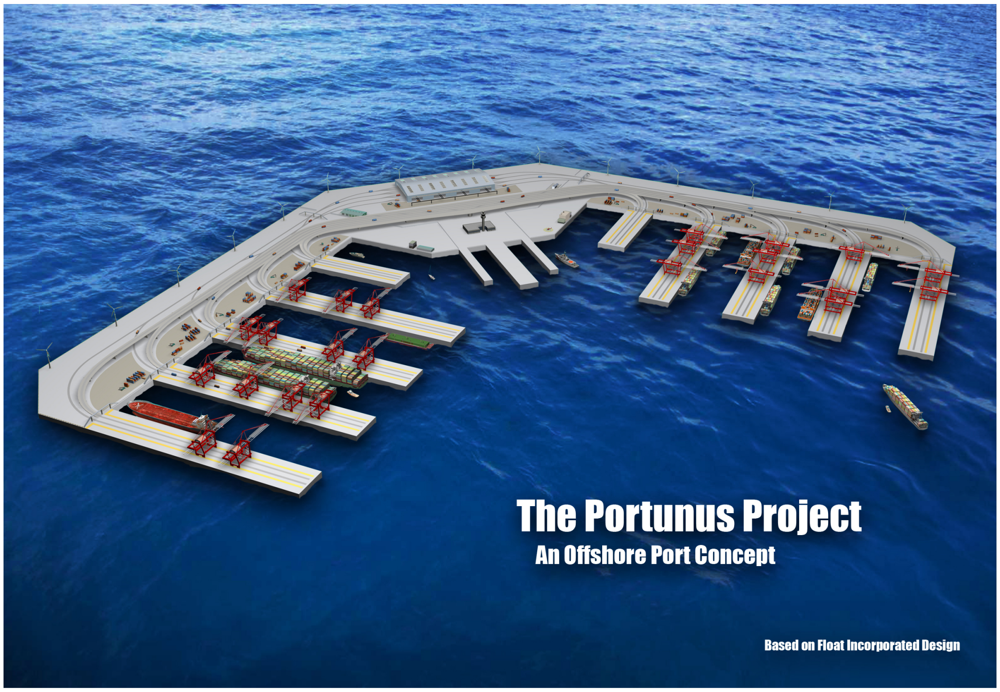

Figure 1. Portunus offshore port

Very large platform technologies have other uses and can spur US economic competiveness in many areas other than ports. Some of the applications that can also use large offshore platforms are aquaculture, transportation, science exploration, energy exploration, defense, desalinization, renewable energy, real estate development and recreation.

There are other factors outside of the national security driver for the development of offshore platforms that we need to consider. One of the most important factors is that the international shipping fleet is in transition. The containerization of freight and an expansion in inventory of larger container vessels are underway.

This transition is highlighted by the deepening of the Suez Canal, the expansion of the Panama Canal (scheduled to be complete in 2014), large investments in port infrastructure (over $4.78B in the last 5 years[9]), and ever increasing orders for larger containerships >12,000 TEU (twenty foot equivalent units).

The Maritime Professional reports in its February 21, 2011 issue, that Maersk placed an order recently with Daewoo Shipyards of South Korea for ten 18,000 TEU capacity containerships, the largest ever built. Each ship will cost approximately $190 million. These ships will produce 50% less CO_2 per container moved than the industry average on the Asia-Europe trade lane. In addition, it will consume approximately 35% less fuel per container than the 13,000 TEU ships now being ordered for this route.

[9] Sieckmann E., Stone D., Porto M., Diaz-Barriga J., Northwestern School of Business, *Portunus Project Review*, San Francisco, June 8, 2010.

The investment of $2B in new ships over the next 5 years is indicative of the scale of investment large shipping is making in new fleets. Access to domestic ports, by these larger ships requires increased dredging, port terminal infrastructure investments, and civic improvements.

Placing floating ports in the major sea lanes inbound to US ports allows for these ships to offload and reload on one stop, transferring their cargo to smaller domestic carriers that go directly to one of the existing 361 US ports providing the most economical route to their cargo's final destination.

Unfortunately, taking existing US ports and making the aforementioned technology upgrades would be improbable in the next 10-15 years due to operational, cost and process constraints. New ports are unlikely due to public opinion, environmental restrictions, permitting issues, and the limited supply of land adjacent to shipping access points. Retrofitting existing ports to provide the efficiencies identified in this report can also be hampered by operational disruptions, strong competition among adjacent ports, and labor unions (recall the west coast port shutdown). Efforts made to date and planned are not widespread but regionally targeted to address the most serious problem areas. Because of these constraints and the economies of scale achieved in developing offshore ports, a strategy to invest in existing port upgrades is not as efficient.

Development of the Concept

The Portunus Project concept is to ultimately establish about five offshore ports that are commercially viable to provide the capability to screen all inbound cargo and transoceanic marine craft bound for the US in about 20 years. The project can be divided into three phases.

The first phase is basic research divided into the three areas; business, technology and government. Research into the business aspects of the project is critical. Clearly, no project can move forward if there is no business case.

The business case should look at the basic economics of international shipping, capabilities needed and development costs for domestic shipping, labor issues, industry sector impacts, macroeconomic impacts and implementation strategies. Since a shipper can circumvent the offshore inspection port by shipping elsewhere in North or Central America, financial constraints need to be identified that mitigate that strategy. For example if a ship diverts to Mexico to offload its cargo, the ship will be in port longer and the containers will need to travel by rail or truck into the US. The cost of this should be more, on average, than the assessed fee. By partnering with Mexico and Canada, the benefits of the offshore ports and its technology can be shared as well.

Technology research will concentrate on scanning technologies, platform operating characteristics, construction methodologies and techniques, materials and the integrated systems needed to operate the platforms and the port. This technology research will continue right up to deployment. The last research element is governmental.

Government jurisdiction, contracts, international trade, admiralty law, Jones Act issues, environmental issues, labor and permitting among others need to be reviewed and a strategy developed to address the policy issues that will arise. Unfortunately in the United States, this is the long pole in the tent. The lack of a defined process of review and approval was a major factor in the placement of an aquaculture project in Mexico that reviewed and approved a project in six weeks, as opposed to the same project incurring a two-year review in the US with no result.[10]

The second phase will provide demonstration projects for aquaculture and desalinization that have favorable economic models in order to gain operating experience with the technology on a small scale and to flush out issues in the regulatory environment.

The U.S. captures and produces less than one third of the $10 billion worth of fisheries products it consumes each year. Domestic production can be improved with the use of offshore platforms. Providing a capability to advance this domestic industry can reduce our national debt and trade deficits.

This aspect of the project development has the benefit of growing the US economy into new industries, creating jobs and revenue for coastal regions while providing cost-competitive domestically produced food and water for US consumption.

The final stage is the design and construction of the platforms for port operations. This needs to occur in a thoughtful manor that does not provide clear incentives for shipping to divert to Canada or Mexico, or for US ports operating behind the offshore port to loose business to other domestic ports. A mechanism to compensate investors who recently upgraded port facilities to handle larger ships may also need to be considered.

Benefits

The greatest advantage of this concept is that the US would have substantially greater security from a WMD delivered from the sea. Because maritime traffic is inspected offshore, port operations in coastal cities will not be disrupted in the event of an attack on a platform. Population centers and regional economies will not be severely affected.

If an attack targets a platform, maritime traffic can be diverted to the remaining platforms for inspection, maintaining the shield. This also allows the US maritime infrastructure to support sustained military operations in response. The key point is that coastal population centers and critical infrastructure are protected. The existence of the platform system itself provides a significant deterrent to a terrorist due to the potential of discovery and interdiction.

Additionally, the US government and ports can avoid expenditures updating monitoring devices in 361 US ports and hundreds of international ports. Instead, it will be able to concentrate technological resources on a few offshore platforms where the screening

[10] Interview w/ Don Kent, Hubbs-Seaworld Research Institute, February 26, 2011.

would occur. Technology already deployed at existing ports can be diverted to land border crossings to enhance the security posture there, because of the incentive for an adversary to exploit land routes connecting the US from other ports in the Americas.

There are many other benefits as well. For the shipping industry, trends in shipping show a movement by international carriers towards larger craft. The larger ships have deeper drafts and require our waterways to be dredged to a depth of 50 feet compared to the existing average depth of 35 feet. The larger ships also require new cranes to expand reach and height in order to offload their containers. Land constraints to hold and process incoming containers offloaded from the larger ships may be problematic in some ports, requiring additional land. These infrastructure improvements would require the expenditure of billions of dollars from shipping companies and the ports themselves.

In addition to the cost avoidance strategies above, the adaptation of offshore inspection technologies may limit the legal liabilities of shipping companies should an attack occur.[11] Offshore ports may be a more efficient delivery model for shipping, allowing the larger international carriers to spend less time in port and therefore more time shuttling cargo. New jobs will be created for longshoremen, shipyards, merchant marine, and coastal regions to construct and operate the platforms, and to provide Jones Act ships. Manufacturing and agriculture jobs will expand due to the increase in domestic manufacturing as a result of macroeconomic issues.

Environmental benefits include reduced dredging of harbors, alternative energy development and the elimination of invasive species threats. Law enforcement benefits include the virtual elimination of seaborne human trafficking and a capability to deter drug smuggling. The technology can also be applied as a platform for maritime domain awareness and remote ocean-based logistics platforms for the Department of Defense. Finally are the benefits achieved through the commercialization of the intellectual property.

Energy exploration is vital to US interests. Vast amounts of oil and gas are located beneath the ocean floor. In October last year, Chevron announced it is spending $7.5 billion to develop two deep-water fields in the outer rim of the Gulf of Mexico, marking one of the oil and gas industry's biggest investments ever in the U.S. offshore area. The Thunder Horse PDQ platform commissioned by BP and ExxonMobil cost $5 billion for the 3.8 acre platform or $1.3 billion/acre. Providing a cost effective alternatives to spar and semi-submersible platforms that are safe for this application would benefit the energy industry.

Renewable energy like wind energy can also utilize floating offshore platforms to harness energy in deeper ocean water close to the coast where the continental shelf drops off rapidly. Thermal ocean flows at these locations, currents and wave action can all be harnessed with a platform as a basis for emerging technologies.

---

[11] Greenberg, M., et.al., *Maritime Terrorism Risk and Liability*, RAND Corporation

Lastly, offshore development can spur other uses in the hospitality, manufacturing, desalinization and real estate industries.

Conclusion

The Department of Homeland Security correctly has developed a strategy that is successful and minimally impacting given current threat levels called the Container Security Initiative. While this strategy is successful now, it can be circumvented given a dedicated adversary. The risk involved becomes too great when an adversary acquires the technology or material for a WMD.

The solution, as identified in numerous national strategy papers[12][13][14], is to provide a capability to inspect commercial and private maritime activity intent on entry, prior to reaching the US - and to do this in a way, for commercial traffic, that does not cause significant disruption or expense to the nation's supply chain. Coupling this capability with developing maritime domain awareness capabilities allows the US to compile a risk assessment for all inbound marine traffic, and to target scarce resources for interception and interdiction.

An offshore inspection port accomplishes this goal and establishes a hub and spoke distribution system where larger ships transfer their cargo to smaller feeder ships or through direct access with intermodal transportation systems. Due to the efficiencies installed on these offshore ports like triple or quadruple pick cranes, automated guided vehicles and parallel screening lines, improved cargo handling rates and reduced time in port provide offsets for capital and operational costs.

The Portunus Project's goal is to develop an offshore platform-based inspection capability that is appropriately scaled and configured to efficiently inspect inbound cargo, without significant delays, detrimental regional economic impacts and without significant increases to the cost of goods.

A detailed economic analysis is a necessary first step in this process. Early work in this area conducted by the graduate business schools at Northwestern University, the University of California at Berkeley and Dartmouth University, indicate a potential overall economic benefit. This preliminary assessment should be followed by a detailed business analysis looking at specific sector impacts, and regional effects. The information gleaned from this work would be used in operational designs, economic models and implementation strategies.

Other than economics, technology and political will are factors that need to be considered when evaluating an offshore inspection strategy. While the technology exists to establish permanent offshore platforms within the control of the US, the scale of an offshore

[12] Department of Homeland Security (DHS), *National Strategy for Combating Terrorism*, Sept. 2006, p.13
[13] DHS, *National Strategy for Maritime Security*, Sept. 2005, p.8
[14] DHS, *Small Vessel Security Strategy*, Apr.2008, p.2

development needed to handle the throughput of commercial maritime traffic is unprecedented.

Stability, survivability, and operational characteristics need to be evaluated in the most economic and credible way possible to provide assurances that we can indeed deliver on the promise of operational and cost effective offshore ports. Concurrent work using computer simulation and scale model testing can examine, at comparatively low cost, the stability of the platforms in various ocean conditions, understand operating limitations, and make design changes easily to maximize safety and capabilities.

With regard to political will, the investments into a more thorough economic and technology assessment are relatively small given the potential economic and security benefits of the approach. If both the economic and technology assessments return a result that the strategy is sound, then the will to move forward is based on realization that the project is in the best interests of the US economy and domestic security.